

# Wandoo crown decline

## Action plan

action plan



Prepared by the Wandoo Recovery Group 2006



Department of  
Environment and Conservation

# Action, communication and research plan

## Table of contents

<b>Introduction</b>	2
<b>Research</b>	3
<b>Mapping</b>	5
<b>Community awareness</b>	6
<b>Partnerships</b>	7
<b>WRG communication plan</b>	8
<b>Timeframe and scheduling of activities</b>	10
<b>WRG research strategy</b>	11
<b>Research priorities</b>	14

# Action, communication and research plan

## Introduction

### Introduction

The Wandoo Recovery Group (WRG) was formed in February 2003 to investigate the causes of wandoo crown decline and develop appropriate strategies and actions. This plan aims to provide direction and encourage collaboration on the future management of wandoo woodlands.

Wandoo (*Eucalyptus wandoo*) is found across much of South Western Australia. It occurs as an overstorey tree in the medium and lower rainfall areas of the wheatbelt and Great Southern regions. Clearing for agriculture has dramatically altered the current range of wandoo. While it remains intact in many parts of State forest, in agricultural areas wandoo is restricted to roadsides, paddocks, isolated farmland remnants or conservation reserves. Many of the remaining areas of wandoo are now affected by crown decline.

Wandoo has made an important economic contribution to the State's development while also providing environmental benefits. For example, it's one of the most important habitat trees for wildlife and is a first-class structural timber, with potential as a farm forestry species in the medium rainfall areas. Wandoo also produces a high-grade honey and the wandoo forest is greatly valued for watershed protection and recreation.

### Vision

The group's vision is that: *Wandoo trees and woodlands are valued by all Western Australians for the range of benefits they can provide and that they continue to exist as functioning ecosystems.*

### WRG's role

To achieve this vision the WRG aims to become an effective leadership and advisory group with a role to:

- communicate the severity and consequences of wandoo crown decline and the need for urgent action;
- promote, support, lobby and coordinate research into wandoo crown decline and recovery;
- develop and regularly update the action plan;
- advocate and facilitate the acquisition of funds/grants for research, survey and recovery work;
- provide a forum for community input; and
- provide feedback on progress to the Minister; land managers, landowners and the community.

### Goals

In carrying out its role, the WRG will focus on four key areas:

- **research** to investigate the causes of wandoo decline;
- **mapping** to accurately identify the status of wandoo's distribution and extent of decline;
- **communication** to increase community awareness and understanding of wandoo crown decline through an on-going public education program; and
- **collaboration and building partnerships** between government, industry and community groups whose support is needed to implement the action plan.

### WRG Action, Communication and Research Plan

This document outlines the WRG's three major plans relating to action, communication and research.

The following Action Plan outlines the group's strategies and actions for each key area. The WRG recognises that this plan is a working document and that outcomes and actions may change to reflect acquisition of knowledge and directional change.

# Action, communication and research plan

## Research

### Research

**Goal statement:** Investigations will lead to a thorough understanding of the nature and causes of wandoo decline. Acquired knowledge will be used to influence future research directions.

**Objective:** To manage research and related activities through coordinating current projects, promoting the need for continued investigations and providing support for funding applications.

Strategy	Actions	Time frame	Who is responsible	Key performance indicators	Cost/resources
<b>Research management</b>  Promote, support and coordinate the management of research	1.1.1 Host a science workshop to give direction and design to research, set priorities and develop a statement of priorities.	July 2005	WRG	Skills and knowledge in areas of wandoo are combined to develop a 'best practice' approach to research.	Venue hire, catering costs, resource aids, administration costs.
	1.1.2 Develop a wandoo research plan that determines direction and sets priorities.	June 2006	WRG, UWA research team	The research plan identifies the key research projects, principal investigators and funding arrangements required.	
	1.1.3 Acquire funds to appoint a research coordinator/project manager.	2006/07	DEC, UWA, WRG	Detailed in WRG research strategy.	Funds accessed to cover FTE position.
	1.1.4 Liaise with tertiary institutions and research bodies to determine the focus of research and to ensure transfer and dissemination of data.	Ongoing	Research coordinator/project manager	Research becomes streamlined, collaborative and integrated in its approach.	
	1.1.5 Liaise with the Tuart Response Group and other interest groups.	Ongoing	WRG, research coordinator	Conservation initiatives in other areas are supported and closer ties developed between conservation workers/volunteers.	
	1.1.6 Explore the opportunity to establish a tree decline steering committee/group to coordinate research and communications efforts to tackle tree decline.	Current	WRG, TRG, PHRG.	All tree health research will be coordinated in one center and adequately funded.	In-kind/monetary assistance to be costed.
Collate existing research and knowledge.	1.2.1 Prepare a paper outlining the scope of the wandoo crown decline situation.	April 2005	Consultant appointed by WRG	A review and analysis of appropriate literature, current research, threatening processes with recommendations for future direction is presented to the WRG.	Approx. \$10,000
	1.2.2 Develop a situation statement outlining current position on wandoo crown decline.	April 2006	WRG	A statement is prepared with contributions from all members.	To be costed.
Facilitate the acquisition of funds/grants for research, survey and recovery work.	1.3.1 Identify all potential funding sources. 1.3.2 Identify the level of funding required. 1.3.3 Approach corporate business, Commonwealth and State Government agencies. Gain support and funding for research and recovery actions.	Ongoing	WRG to assume this role until a research coordinator is appointed.	Funds/support accessed. New partners become members of WRG or provide support.  New grants are accessed and applications submitted and approved.	Matching funds/in-kind provided by the WRG/support agency/other partners.

# Action, communication and research plan

## Research

Strategy	Actions	Time frame	Who is responsible	Key performance indicators	Cost/resources
	<p>1.3.4 Define funding (NHT and NAP) for wandoo research/recovery as a Statewide project encompassing biodiversity and woodland decline.</p> <p>1.3.5 Identify and communicate outcomes to funding sources.</p>			Regular reports inform partner agencies and stakeholders about progress of research and how money has been spent.	
<p><b>Research activities</b></p> <p>Support research into of the causes wandoo decline.</p>	<p>1.4.1 Support current UWA research and monitoring projects (Ryan Hooper, Pieter Poot).</p> <p>1.4.2 Undertake specific field plot investigations and monitoring of sites to link with research sites.</p> <p>1.4.3 Liaise with community groups (e.g. Green Corps, Naturalist Clubs, non-government organisations and Land Conservation District Committees and gain support for research, survey and monitoring projects.</p>	<p>Ongoing</p> <p>Ongoing</p> <p>Ongoing</p>	<p>DEC, WRG</p> <p>WRG, DEC</p> <p>WRG, DEC</p>	<p>Positive working relationship between research team and WRG. Wherever possible the personal and equipment requirements of the research team are met.</p> <p>A collaborative approach to projects that cover the desired outcomes of the WRG and those of partner organisations.</p>	<p>Officers' time, aerial photos, (GIS) technology.</p>
<p>Define the status of ground water and surface water in the Helena catchment.</p>	<p>1.5.1 Work closely with Department of Water (with Water Corporation input) to determine previous ground water levels and bore locations.</p> <p>1.5.2 Measure existing piezometers and monitor long-term trends in ground water levels throughout the Helena catchment at three-five year intervals.</p>	<p>October 2004</p> <p>July 2004 Ongoing</p>	<p>DEC, WRG, Mr Frank Batini</p> <p>Liz Manning, Mr Frank Batini, contractor</p>	<p>Bore data obtained. Specific bores identified for re-measuring.</p> <p>Status of ground water levels in specific bores is determined and trends surmised. A report is presented to WRG. Bores drilled, water levels determined.</p>	<p>\$1,300.00 - contract costs. \$1,250.00 - contract costs.</p> <p>\$1,100.00 contract costs.</p>

# Action, communication and research plan

## Mapping

### Mapping

**Goal statement:** Accurately determine the extent and severity of wandoo decline.

**Objective:** Map the status of decline across the range of wandoo using existing technology.

Strategy	Actions	Time frame	Who is responsible	Key performance indicators	Cost/resources
Support projects to identify the extent and severity of decline in specific locations.	2.1.1 Map epicentres of wandoo decline in six regions of the South West (Helena catchment, Julimar Conservation Park, Drummond Nature Reserve, Dryandra Woodland Reserve, Talbot Block and surrounding forests near York) using Landsat interpretations.	December 2005/2006	DEC	A series of maps identifying areas of wandoo canopy loss/recovery. Scientific journal publications and internal reports produced.	\$55,000.00 to salaries, travel, field equipment, map production and printing, publishing.
	2.1.2 Re-examine earlier research sites. (J. Mercer; P. Brown transects) and compare against previous observations.	December 2006	WRG, assisted by J.Mercer	Any change in the rate or spread of decline is recorded and information used to update mapping.	Contract costs.
Ground truth the information on wandoo decline gained by vegetative mapping surveys.	2.2.1 Design a simple guide to evaluating crown condition that represents the stages of decline.	January 2005	Kim Whitford, Allan Wills, Liz Manning	Draft procedure is tabled to WRG for discussion and approval.	Officer training, volunteer time, data collection and collation.
	2.2.2 Table draft guide to WRG for comment.	February 2005	WRG / DEC WRG / UWA	WRG supports ongoing procedure.	
	2.2.3 Field-test guide for reliability.	February 2005		Field trials identify gaps.	DEC resources in printing field guide.
	2.2.4 Undertake training of volunteers in correct use of the guide.	Ongoing		Community groups adopt this guide to record the status of decline in local areas.	

# Action, communication and research plan

## Community awareness

### Community awareness

**Goal statement:** Community awareness of wandoo crown decline and the underlying causes is increased.  
This awareness is shared between groups with differing interests in wandoo.

**Objective:** Develop a communications and public participation plan that targets all necessary sectors of the community.

Strategy	Actions	Time frame	Who is responsible	Key performance indicators	Cost/ resources
Plan, coordinate and implement an on-going public education program to raise awareness and knowledge about wandoo decline and the WRG.	3.1 Information on WRG activities and current research directions will be printed in a number of DEC and other publications.	Ongoing	WRG	A positive response is received from a broad spectrum of the community.	
	3.1.1 WRG bulletins: A series of news bulletins updating the community on the progress of research and activities of the WRG will be printed and circulated widely.	Ongoing as required	WRG		Approx. \$2,500.00 per issue (3000 copies). DEC resources input from WRG members. Officers' time, costs associated with photography, administration, publishing.
	3.1.2 <i>LANDSCOPE</i> magazine: Two stories to be submitted. • A story describing the ecological importance of wandoo, history of decline and WRG activities. • A second story detailing the research findings and mapping of wandoo decline in State forest and DEC reserves.	April 2005	Liz Manning, Peter White	Story printed in the Autumn 2005 issue.	
		December 2006	WRG	Story printed in the Summer 2006/07 issue.	
	3.1.3 Western Wildlife and other publications: Specific stories highlighting WRG activities and community participation will be written.	Ongoing	WRG members and partners	A positive community response to the articles is received. This response is used to evaluate the level of community interest.	Staff time and resources.
3.1.4 Conduct personal presentations to raise awareness and strengthen alliances with regional and sub-regional natural resource management groups.	As required	WRG members, DEC staff, research coordinator	Increased support towards and involvement with WRG activities by the local community and sub-regional groups.	Time, resources, maps, brochures.	
Improve the provision and coordination of wandoo information to the Minister, active partners and other interested parties.	3.2.1 Reports detailing progress of research and activities relating to wandoo recovery are forwarded on a regular basis.	Quarterly	Liz Manning	The Minister is informed of WRG progress through regular reporting procedures.	Administration costs, executive officer's time.
	3.2.2 Communicate new directions and achievements in research and project work from updated action plans	Annual	WRG committee	WRG Action Plan is reviewed annually.	Staff time.
	3.2.3 Designated government agencies have linked websites to provide information on wandoo decline.	Ongoing	DEC	Information is regularly updated and available to a wide network of NRM stakeholders and active partners.	Administration costs/staff time
	3.2.4 Maintain regular dialogue between WRG partners and other groups.	Ongoing		Closer ties developed with other groups.	

# Action, communication and research plan

## Partnerships

Strategy	Actions	Time frame	Who is responsible	Key performance indicators	Cost/ resources
Encourage community input and feedback.  Encourage community participation leading to the acquisition of skills, knowledge and experience.	This will be achieved through direct consultation via meetings, workshops and personal presentations. 3.3.1 Interested observers are welcomed at WRG meetings.	Ongoing	WRG	Community members have the opportunity to discuss research investigations into wandoo decline. Positive community response is gauged.	WRG members' time.
	3.3.2 Conduct information days and workshops to provide a forum for input and feedback.	Ongoing	WRG and partners		
	3.3.3 Create opportunities for participation.	Ongoing		Partnerships formed and projects developed that support participation.	
	3.3.4 Implement public participation programs that encourage volunteers to assist with WRG activities such as assessment and recording of wandoo crown decline.	As required	WRG/ DEC	Community involvement leads to increased knowledge and skills.	Funds acquired to cover FTE project coordinator.

### Partnerships

**Goal statement:** Collaborative partnerships will be built or consolidated between groups with interests in wandoo whose support is needed to implement the wandoo action plan.

**Objective:** WRG will continue to build supportive links with government, industry and community sectors.

Strategy	Actions	Time frame	Who is responsible	Key performance indicators	Cost/ resources
Strengthen alliances and build partnerships with government, industry and community sectors.	4.1.1 Identify potential partners and seek one-on-one meetings.	Ongoing	WRG executive will perform duties until a research coordinator is appointed.	Collaborative approach to projects that cover the desired outcomes of the WRG and those of partner organisations.	Costs covered by funds to cover FTE position.
	4.1.2 Identify the level of funding requested/ required.				
	4.1.3 Support and develop collaborative research programs assisted by Commonwealth/State Government funding. Seek support from local government authorities for research and related projects.	Ongoing	WRG research manager/ coordinator	Ideas generated from the workshop will be used to develop a research strategy and framework that captures current research hypotheses and resource management.	
	4.1.4 Achieve guaranteed resourcing commitments from research partners (DEC, industry and universities).				
	4.1.5 Invite current and potential partners to science workshops and future meetings.				
	4.1.6 Identify and communicate outcomes from the science workshop to funding sources.				

# Action, communication and research plan

## WRG communication plan

### WRG communication plan

The WRG recognises the need for an extensive communication program to raise public awareness about wandoo decline and gain support to implement the WRG Action Plan. This plan has been developed with an emphasis on public participation. The WRG acknowledges that community support and participation is essential to achieve its objectives.

#### Key focus areas are:

- community education to boost levels of knowledge and awareness about wandoo;
- regular reporting to the Minister, key stakeholders and interested groups on the progress of research and WRG activities;
- consultation, joint planning and opportunities for community participation; and
- collaborating and building partnerships with government, industry and community sectors.

**Objective:** Community awareness of wandoo crown decline is increased. This awareness is shared between groups with differing interests in wandoo.

Strategy	Actions	Target audience
Coordinate and implement an on-going education program to raise public awareness and knowledge about wandoo decline and the WRG.	<p>This will be achieved through the distribution of a series of news bulletins and media releases via rural press and DEC publications such as <i>LANDSCOPE</i>, <i>Western Wildlife and Environment and Conservation News</i>.</p> <ul style="list-style-type: none"> <li>• Local stories and events will be distributed to rural press on a regular basis.</li> <li>• A series of WRG news bulletins will be circulated to local authorities, government agencies, NRM and community groups throughout the range of wandoo.</li> <li>• Information on current projects will be disseminated via regional NRM newsletters and networks.</li> </ul> <p>Two stories to feature in <i>LANDSCOPE</i>. The first describes wandoo, its environmental and economic values; the onset of crown decline and the role of the WRG (April 2005). The second story will focus on the research and current projects of the WRG, what has been learnt and how knowledge gained can guide future directions (December 2006).</p>	Government departments, local authorities, regional NRM organisations, LCDCs, environmental groups and interested citizens.

**Objective:** Improve the provision and coordination of wandoo information to the Environment Minister, active partners and other interested parties.

Strategy	Actions	Target audience
Regular reporting on progress of research and new directions.	<ul style="list-style-type: none"> <li>• Progress reports on research and WRG projects are circulated.</li> <li>• A wandoo web link to DEC's NatureBase website will provide information about wandoo crown decline, research and WRG activities.</li> <li>• Designated government agencies have linked websites to provide information on wandoo decline.</li> <li>• Interested observers are welcome to attend WRG meetings and workshops.</li> </ul>	The Minister, active partners and interested groups.
Maintain open and interactive dialogue between the WRG members and active partners.	<ul style="list-style-type: none"> <li>• Maintain regular dialogue between WRG partners and other interest groups (TRG, PRG, DEC, research institutions).</li> <li>• Encourage open and active discussions between meetings to progress projects and generate new ideas.</li> <li>• Distribute information and items of interest.</li> </ul>	WRG members and active partners.

# Action, communication and research plan

## WRG communication plan

**Objective:** Create a forum for community input and participation.

Strategy	Actions	Target audience
Foster community input and feedback.	This will be achieved through direct consultation via information meetings, workshops and personal presentations that give participants an opportunity to learn about wandoo, provide input and obtain feedback. <ul style="list-style-type: none"> <li>• Community information days and field excursions.</li> <li>• Public forums.</li> <li>• Wandoo workshops.</li> <li>• Personal presentations to community groups.</li> <li>• Interested observers welcomed at WRG meetings.</li> </ul>	Community groups and others with similar interests in wandoo.
Encourage community participation leading to the acquisition of skills, knowledge and experience.	Plan, coordinate and implement community participation programs. <ul style="list-style-type: none"> <li>• Create opportunities for participation.</li> <li>• Implement participation programs for community groups/volunteers to assist with activities such as assessment and recording of wandoo crown decline.</li> </ul>	Community groups (Naturalist clubs, LCDC, friends' groups, farmers, land managers), Green Corps Teams.

**Objective:** Establish networks and partnerships between groups with interests in wandoo whose support is needed to implement the wandoo strategy and action plan.

Strategy	Actions	Target audience
Involve and work directly with people in decision-making, planning and strategies to address wandoo decline.	<ul style="list-style-type: none"> <li>• Advise and provide input into regional NRM Strategies and Investment Plans.</li> <li>• Seek one-on-one meetings and collaborate with potential partners in relation to alignment of research programs, mine rehabilitation and information useful.</li> <li>• Support applications for Commonwealth/State Government funding.</li> <li>• Collaborate and build partnerships with local government authorities for research and on-ground projects.</li> <li>• Achieve guaranteed resourcing commitments from research partners – DEC, industry, universities.</li> <li>• Host wandoo science workshops and communicate the outcomes to funding sources.</li> <li>• Identify the level of funding requested and required.</li> <li>• Invite active partners and sponsors to attend WRG meetings.</li> </ul>	Regional NRM groups, government agencies, local authorities, corporate business, mining companies research groups and institutions.

# Action, communication and research plan

## Timeframe and scheduling of activities

Activities	2005				2006			
	Jan/March	April/June	July/Sept.	Oct./Dec.	Jan/March	April/June	July/Sept.	Oct./Dec.
<b>Education program</b>								
WRG bulletins distributed								
Stories featured in <i>LANDSCOPE</i>								
Other media articles appear in rural press								
<b>Reporting</b>								
Reports on progress of WRG to Minister and key stakeholders								
Link with DEC's NatureBase website to provide information on wandoo								
WRG meetings								
Distribute other information as required								
<b>Consultation</b>								
Information days and personal presentations to community groups								
Plan, run and report on information day at Dandaragan								
Plan, run and report on wandoo community forum								
Plan, run and report on wandoo science workshop								
<b>Joint planning and participation</b>								
Community/volunteer training in mapping crown condition in wandoo								
Strategic planning and development between WRG and active partners								
Wandoo research plan developed								
<b>Partnerships</b>								
Input into Natural Resource Management Investment Plans								
Follow-up one-on-one meetings with various stakeholder groups								
Research organisations								
Industry partnerships								

### WRG research strategy

#### Objectives

Future research needs to be planned in order to ensure that:

- research focuses on identifying the cause(s) of wandoo crown decline (WCD);
- research aims at identifying management options for WCD;
- the chances of funding are increased;
- coordination and integration of research projects are maximised locally and nationally; and
- all stakeholders are encouraged to participate fully.

#### Elements of research into WCD

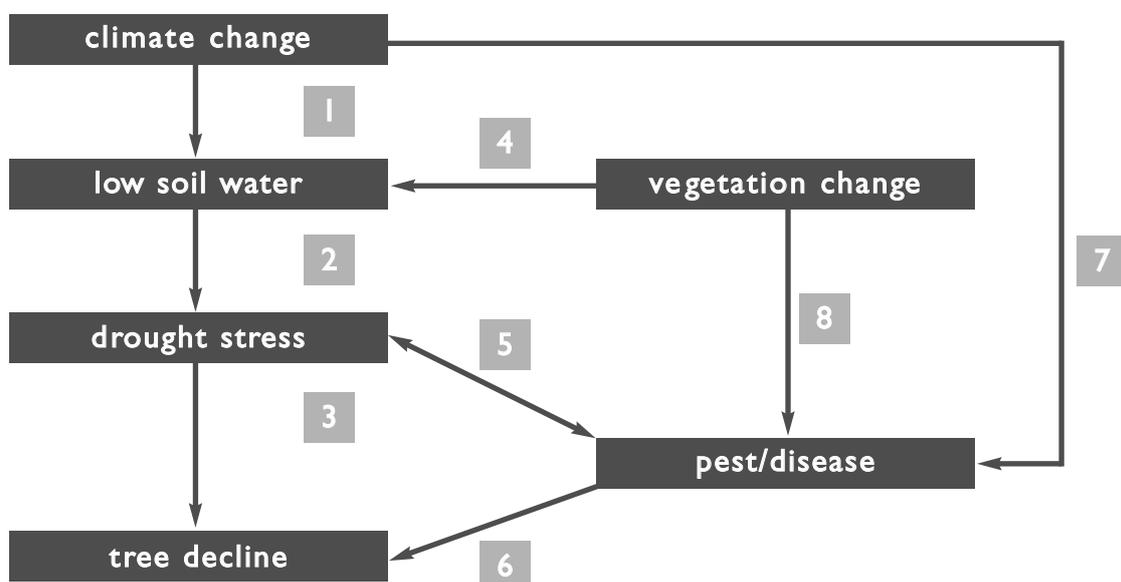
1. **Historical research:** retrieve and document historical information, oral or written, on wandoo health in order to relate this to climatic and anthropogenic factors.
2. **Monitoring/mapping:** use remote sensing and field surveys to analyse current and long-term (multi-year) trends in wandoo woodland health. This assessment is at the landscape to regional scale and includes any historical surveys/aerial photos/satellite images. The monitoring of wandoo woodlands has previously been classified as 'mapping' as distinct from 'research' but it should be an integral part of research.
3. **Hypothesis-driven research:** specific well-defined projects that address major or partial research questions in the context of a larger conceptual research framework.

All three areas of research are essential and need to be investigated concurrently.

#### Conceptual framework

Research into WCD should be based on a central hypothesis (or limited number of alternative hypotheses). This provides the framework for a research strategy. It needs to be as simple as necessary (focusing on the major factors, as indicated by current evidence), and not prematurely exclude plausible alternative hypotheses. The research should not be limited to observational studies but rather aim at testing hypotheses by experimentation at appropriate spatial scales.

The diagram is a simple representation of the framework that captures current research hypotheses.



The project on wandoo response to drought (Poot) focuses on the drought stress of trees (arrow 3) and to some extent on how this relates to soil water (2). Research into the climatic (1) and vegetation (4) drivers of drying soils is not being directly addressed at present. The project on pathology (Hooper) studies the direct impact of borers and fungi (6), the impact of climate change on pest and disease, both directly (7) and indirectly (5) and the impact of vegetation change on pest and disease (8).

This diagram does not address alternative hypotheses such as direct effects of fire regime on soil biology or chemistry, local (fox-driven) extinction of marsupial species etc. Research projects into such hypotheses are of interest, but are not the logical priority at this stage. If specific funding opportunities for such research exist, they are worth pursuing.

### Criteria for prioritising research issues

- Research that aligns with the conceptual framework.
- Working hypotheses based on evidence.
- Research that aims at identifying major factors involved in WCD throughout the geographical range of wandoo.
- Research that produces feasible and sustainable recovery outcomes.
- Research explaining why wandoo is susceptible to decline whereas other species are not (or less).
- Issues that are researchable (hypothesis testable).

### Resourcing

Ideally all tree health research would be coordinated in one center and adequately funded.

The CRC model is probably not appropriate, as tree health research does not generate an immediate economic benefit. An attractive alternative is the ARC Linkage scheme, where industry, State Government agencies, NRM councils and local government authorities can be partner organisations with universities.

It is recognised that there are different project funding models, ranging from a series of small projects to one large integrated program.

#### Project structure

- Scientists at universities/government institutions to supervise, advise, participate, and seek funding.
- PhD students or postdoctoral fellows who work on funded projects for a specified period.

#### Program structure

- A dedicated research manager (scientist) to coordinate research, raise funds, liaise with stakeholders etc.
- Scientists at universities/government institutions to supervise, advise, participate, and seek funding.
- A series of integrated projects for PhD students or postdoctoral fellows for a specified period.

#### Personnel

- Undergraduate research students (honours), working on small, well-defined projects and/or contributing to larger projects.
- Volunteers.

### Funding and partnerships

#### Scale

- **Project funding:** for specific research questions, usually one-three year duration, PhD student(s) and/or postdoctoral(s). Funding opportunities: ARC Linkage, Land and Water, and industry (to be costed).
- **Program funding:** for a coherent long-term research program consisting of multiple projects. Funding opportunities: ARC Cooperative Research Centre (national), ARC Centre of Excellence, Commonwealth Environmental Research Facility (national), Centre of Excellence (WA) and industry (to be costed).

#### Sources

- **Commonwealth Government:** Link to NRM Councils and regional partnerships. Strong community linkage, must be practical and not just research (ground truthing of remote imagery and monitoring of decline/bore levels, surveys, 'operational research' capacity building). ARC Linkage, Land and Water (long term research opportunities and multi- disciplinary).
- **State Government:** funding from agencies (Department of Environment and Conservation, Department of Water, Forest Products Commission, CSIRO), and Centre of Excellence. Projects that cover WRG outcomes and those of partner organisations will help to achieve corporate goals.
- **Local government:** WALGA endorsement, cash/in-kind (outcomes within 10 years)
- **Industry:** Elders, machinery dealers, Wesfarmers, mining companies (Alcoa, Worsley/Boddington Gold), CBH, Alinta, Woodside, (well-defined outcomes within two-three years).
  - **Benevolent donations:** Lotterywest.
  - **NGO's:** WWF - Australia, Conservation Council of WA.

A dedicated research manager is crucial to secure funding and run a large research program. Funding for this position must be sourced from non-ARC funds.

Individual (smaller) research projects can be designed, submitted for funding, and run by university or other scientists. It is extremely difficult to build a coherent research strategy on the basis of individual projects, due to lack of continuity, limited coordination, poor integration, absence of vision etc.

### The way ahead

- Explore opportunities for other long-term large research program funding (e.g CRC, though probably limited) (Veneklaas/Barbetti/Lambers).
- Source funds to appoint a research coordinator to seek research funding in a more concerted and sustained way (WRG).
- Continue to apply for (smaller) research projects (UWA).
- Develop CoE and CERF programs with collaborators (Veneklaas).

### Communication and awareness raising

- **Situation statement:** a concise, factual document giving the current position of wandoo decline.
- **Landscape article:** features research into wandoo decline – December 2006.
- **Presentations:** to regional NRM councils and targeted local authorities.
- **Tree decline forum:** highlighting progress of science and research into decline of tuart and wandoo.
- **Projects:** will underpin an ARC approach similar to current UWA project.

# Action, communication and research plan

## Research priorities

### Research priorities (arising from the wandoo science workshop)

RESEARCH	COMMENTS
<p><b>Ecophysiology</b></p> <ul style="list-style-type: none"> <li>Genetic variation – within site variability, glasshouse studies – PhD finalised February 2007.</li> <li>Roots. Sub-surface exploration to identify depth and health of fine roots and their loss.</li> <li>Water relations – where does the water come from and how is it used?</li> <li>Comparison of sites with healthy and unhealthy crowns.</li> <li>Soils: Structure of soils and how this influences growth of wandoo.</li> </ul>	<p>Current research projects - high priority and will be continued.</p> <p>A vital component of this research.</p>
<p><b>Climate research</b></p> <ul style="list-style-type: none"> <li>In relation to wandoo decline/recovery.</li> <li>Evidence of decline during a good rainfall year.</li> <li>Collation and re-activation of previous hydrology research.</li> <li>Re-evaluate water relations – site specific interactions.</li> </ul>	<p>Could be factored into research identifying drought stress.</p>
<p><b>Phytopathology</b></p> <ul style="list-style-type: none"> <li>Fungi/insects/borer relationships.</li> </ul>	<p>A current research project - high priority and will be continued.</p>
<p><b>History of previous cycles of decline/recovery</b></p> <ul style="list-style-type: none"> <li>Research early reports of decline (pre 1980s).</li> <li>Look for cycles (use aerial photos, interviews, literature, and paleo/dendro time).</li> <li>Compile an archive (paddock trees verses native or private remnants).</li> <li>Link decline events in space and time.</li> <li>Link life cycle of decline (ups and downs).</li> <li>Link pattern of decline – matching short / long-term phenology (leaf formation).</li> </ul>	<p>High priority and could be an honours project.</p>
<p><b>Mapping areas of decline at landscape levels</b></p> <ul style="list-style-type: none"> <li>Trend analysis.</li> <li>Overlay rainfall data with canopy data.</li> <li>Use a high rainfall year - better detect rainfall signal.</li> <li>Analysis of other factors e.g. fires.</li> </ul>	<p>High priority. Current data will provide information to assist intervention trials.</p>
<p><b>Management trials</b></p> <ul style="list-style-type: none"> <li>Fire – intensity, frequency.</li> <li>Stand density – logging/timber harvesting.</li> </ul> <p>Other intervention trials</p> <ul style="list-style-type: none"> <li>Irrigation/'drought' by interception.</li> <li>Understorey competition.</li> </ul>	<p>High priority. Fire trials to test response to changed fire regimes.</p> <p>Not a current priority.</p>
<p><b>Network with other tree decline groups</b></p> <ul style="list-style-type: none"> <li>TRG, PRG, CPSM.</li> </ul>	<p>Underway and ongoing.</p>
<p><b>Modelling</b></p> <ul style="list-style-type: none"> <li>Long-term change scenarios.</li> <li>Spatial models of environmental management variables implicated in wandoo decline.</li> </ul>	<p>Not able to be done at present.</p>
<p><b>Biotic factors</b></p> <ul style="list-style-type: none"> <li>Mycorrhiza.</li> <li>Armillaria in wandoo (build on previous work).</li> <li>Predation.</li> <li>Nutrient relations/recycling.</li> <li>Other faunal relationships.</li> </ul>	<p>Not a current priority.</p>
<p><b>Meta Analysis</b></p> <ul style="list-style-type: none"> <li>Scientific data.</li> </ul>	<p>Not a current priority.</p>

